**Transparent and Opaque Pigments**

On an elemental level, a pigment can be described by both its size and composition. Generally speaking, transparent pigments are smaller in size and of a composition that allows more binder to be packed in tightly around the particles. Hence, transparent and semi-transparent colors have a higher percentage of binder to pigment. Exactly *how* the size and composition of a pigment manifests its physical properties in a binder is why a painter might choose one color over another.

**Interaction with Light**

*Opaque pigments* and *transparent pigments* interact with light striking the painting in different ways.



*Opaque pigments*, such as cadmiums, synthetic iron oxides, and whites all have great covering power and lend themselves to the direct painting techniques of the Impressionists. These colors reflect a greater percentage of light, resulting in a bright, saturated appearance. The color often appears the same whether the paint is applied thinly or thickly.



*Transparent pigments* interact with light differently. Thick applications of transparent color often appear dark or muted, since much of the light hitting the paint is absorbed into the paint film before reflecting back. When transparent colors, such as Ultramarine Blue, Indian Yellow, or our Transparent Earth colors are applied thinly over high value underpaintings, light is allowed to travel through the thin vale of color, reflect off the underpainting and travel back through the transparent color to the viewer’s eye. The painting appears like it is being lit from within. The application of transparent paint layers in this manner is the basis for the indirect painting techniques of the Classical Era, where multiple layers of transparent glazes were applied over a monochrome underpainting.

**Natural or Synthetic Pigments**

Please make sure that you have downloaded the Gamblin Color Chart as it provides an instructional look at color.  Note that colors are broken into two main categories:  **Mineral Inorganic & Modern Organic**.

The **Modern Colors** have their foundation in organic chemistry of the early 19th century and are all synthetically derived from "coal-tar".  They were first used as dyes but not very popular due to fading until later they "bonded" to larger inert particles effectively making them lightfast pigments.  The American automotive industry's wide use of modern organic pigments likely made it possible for other industries, including artist paint makers like Gamblin, to have quality synthetic pigments readily available.

One might presume that the **Mineral Colors** on the other side of the color chart are all "natural" because they are derived from inorganic earth.  Historically, only the iron oxides like yellow ochre and raw umber have been made into color as ground rock straight from the earth. Today, naturally occurring ochres, umbers and sienna’s are rarely mined, but synthetized almost entirely in furnaces.

Virtually all other mineral colors like mars black, titanium white, cadmiums, cobalts, alizarin crimson, ultramarine blue and manganese violet (to name a few) are synthetically manufactured by combining various metals at extremely high heat for hours at a time.  The time spent in the furnace determines whether a cadmium red, as one example, is light, medium or dark.  Hundreds of years ago, ultramarine blue was ground from lapis lazuli, a semi-precious stone made up of several different minerals.  The ultramarine blue pigment we synthesize today is *chemically identical* to lazurite, the prized blue mineral component in lapis lazuli.  Modern ultramarine blue is brighter, more intense and chemically purer than historical ultramarine blue.

Many painters are surprised to find that the incredible range of mineral *and* modern colors are all produced “synthetically”- in a either a factory furnace or a laboratory.

Another feature of our Artists Color Chart is the further separation of colors into Classical, Impressionist and 20th Century groupings.  Renaissance era painters only had "Classical" colors available while the 18th century Industrial Revolution introduced brighter, mostly opaque "Impressionist" colors to the painter's palette.  The first modern synthetic organic pigments were created in the late 19th century ushering in an era of colors unprecedented in their ability to make clean, bright mixtures without 'greying-down" like mineral colors.

**Comparing Earth Colors**

Gamlin likes to share this comparison of different earth colors because it’s a nice snapshot look at opaque and transparent within a range of similar hues.

There are three types of earth colors:

* **natural iron oxides** (some umbers, siennas, and ochres)
* **synthetic iron oxides** (sometime called “mars”, most earth colors produced today)
* **transparent synthetic iron oxides** (hydrated synthetic iron oxides)

**Natural iron oxides** are relatively weak in opacity and tinting strength because they contain only 40-60% iron oxide. The remaining percentage consists of "impurities" such as silica, or manganese in the case of the Umbers. This level of impurity gives the colors their delicacy. (A mix of different pigment sizes and compositions.)

**Synthetic iron oxides**, the Mars colors, have been manufactured since the 18th century. They are 100% iron so they are very strong in tinting strength and very opaque. During the 20th century, all natural earth colors have become synthetically made more opaque because these earth colors are used primarily to color concrete and stucco. The building trades want opaque earth colors.

**Hydrated synthetic iron oxides**, like Gamblin Transparent Earth Colors, are made by taking synthetic iron oxide and hydrating the molecule (just like hydrating Chromium Oxide Green makes Viridian). This process makes the opaque color beautifully transparent. What is confusing is the manufacturers did not create a separate Pigment ID number so Mars Red and Transparent Earth Red have the same ID number (PR 101), even though they do not resemble each other.